

# PATENT SPECIFICATION



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## COMPLETE SPECIFICATION.

### Process of and Apparatus for Burning Substances of Low Combustibility, such as Asphaltum, Tar, Acid-resin, Pitch, Masut or the like.

We, METALLGESELLSCHAFT AKTIEN-GESELLSCHAFT, a Corporation organised under the Laws of Germany, of 45, Bockenheimer, Anlage, Frankfurt-on-the-  
5 Main, Germany, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

10 This invention relates to a process of and apparatus for burning substances of low combustibility, such as asphaltum, tar, acid-resin, pitch, masut or the like.

Numerous proposals exist, for burning combustible substances, in a liquid or semi-liquid condition, in rotary drums. The fact that such proposals have hitherto remained devoid of practical importance is due to certain reasons. For

20 instance, in the case of substances which burn directly without the formation of solid by-products or residues, and extensive, and therefore costly, combustion apparatus, such as is represented by a

25 rotary drum, is irrational and superfluous. On the other hand, in the case of substances, such as asphaltum, tar, acid-resin, pitch, masut or the like, which are not fuels in the true sense and do not except at high temperatures, vaporise or ignite, or furnish intermediate products requiring, for the purpose of combustion, a further special treatment, such as pre-heating, the apparatus hitherto proposed and known are ineffective.

The present invention aims at enabling such substances to be burned. To this end, the invention consists in treating such substances in a rotary tube by first passing the substances through a distillation zone, and then leading the solid and gaseous distillation products directly through a combustion zone, both zones being disposed in such a manner that the distillation process is effected by the radiant heat of the combustion zone.

The substances are introduced into the distillation zone in a liquid, or semi-liquid condition, so that they are heated by the radiated heat of the main com-

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bustion zone, with the result that the volatile constituents vapourise and ignite. At the same time the non-volatile constituents are partially coked. This coke is transferred, by suitable means, from the distillation zone into the main combustion zone, where it is raised to ignition temperature by the hot gases from the burning distillates.

The process is conducted in such a manner that either an excess of oxygen is already present, for the combustion of the coke, during the combustion of the readily volatile distillates, or else fresh oxygen is admitted into the main combustion zone and serves for burning the coke. The latter method has proved the more suitable inasmuch as in this case, no undesirable lowering of temperature is to be feared in the vaporising zone.

The invention enables the distillation and coking, on the one hand, and the combustion of the distillation gases and the coke, on the other, to be effected, simultaneously and jointly in a single working operation. An essential condition for the practicability of the process is that the distillation gases, coke and air of combustion should move in the same direction.

In order more clearly to understand the invention, reference is made to the accompanying drawings which illustrate by way of example an embodiment of rotary-tube furnace suitable for carrying out the herein-described process and in which:—

Fig. 1 is a longitudinal section; and  
Fig. 2 a cross section along the line  
a—a of Fig. 1.

The furnace illustrated is divided into three sections, which follow in succession without any external interruption. These sections comprise a distillation chamber 1, and the main combustion zone 2, which is followed by a secondary-combustion zone 3.

The distillation chamber has a smooth wall, which widens out towards the main combustion zone, and is usually con-

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structed of masonry. It communicates directly with the main combustion chamber 2, so that the heat from that chamber can radiate unhindered back into the 5 chamber 1. It is also fitted with a scraper device 4 which, with the aid of a cooled scraper bar 5, and a scraper 6 attached to the end of the latter, detaches the incrusting coke and enables it 10 to be moved into the chamber 2.

In order to prevent the over-rapid movement of the resulting coke—which is more or less fine in grain, according to the properties of the coked crude product 15—into the secondary-combustion zone 3; the main combustion zone of the furnace is in the form of a tube of larger diameter than the distillation chamber. It is also provided with baffle rings 7, 20 of known type, which serve the same purpose. In order, on the one hand, to effect the heating of the coke to ignition temperature in the quickest and most intensive manner possible, and on the other to 25 assure that the coke, raised to combustion temperature, will be bathed, as completely as possible with gases containing oxygen, or with air, the main combustion zone is also fitted with agitating devices 8 of 30 known type.

For the purpose of admitting the oxygen needed, chiefly in the main combustion zone, for the combustion of distillation gases and coke, fresh-air nozzles 35 9 are provided in that part of the furnace in which the combustion proceeds, and therefore both in the main combustion zone 2 and in the secondary-combustion chamber 3. These nozzles may, of course, 40 also serve for admitting into the furnace, gases, other than air, which are suitable for the combustion process.

It has been found suitable to provide, in the rear of the rotary tube furnace 45 serving for the combustion of the said fuels, a hot-gas chamber 10 which, serves on the one hand, for completing the combustion of any still unconsumed combustible gases, and, on the other hand, for 50 collecting any coke that remains unconsumed as the result of irregular management or overloading of the furnace, and to burn such coke by means of known devices, such as a stepped grate 11.

55 The said chamber enables the temperature of the hot gases produced to be regulated, according to their application, by the admission of cooler gases or air. The hot gases generated in this manner 60 can be employed, at convenience, for operating metallurgical furnaces, or, as is chiefly designed in Fig. 1, may serve for utilising the heat by means of steam boilers or like apparatus.

65 The invention is of particular value in

cases where the utilisation of otherwise worthless products, such as acid-resins from the oil industry, is in question. In such cases, the herein-described process and apparatus serve to dispose of these troublesome and not easily treated products and, at the same time to render them economically useful.

Having now particularly described and ascertained the nature of our said invention and in what manner the same is to be performed, we declare that what we claim is:—

70 1). A process for burning substances of low combustibility, such as asphaltum, tar, acid-resin, pitch, masut or the like, which comprises introducing said substances in a liquid or semi-liquid condition into a rotary tube, and gasifying same in the first zone of said rotary tube, whereupon the gaseous and solid gasification products pass into a second zone, directly adjacent to said first zone, in which second zone they are burnt to furnish by their combustion the whole or the bulk, of the heat needed for the gasification.

75 2). Process as set forth in claim 1, in which the products of combustion issuing from the second zone of the rotary tube are passed into a secondary combustion zone for the purpose of burning the still unconsumed residues.

80 3). Process as set forth in claims 1 and 2, in which the substances to be burned, i.e., the volatile and non-volatile products produced in the first zone of the rotary tube are led, together with air for combustion introduced at a suitable point, through the furnace in the same direction.

85 4). Process as set forth in claims 1 and 3, in which air for combustion is admitted directly into the combustion zone.

90 5). Apparatus for carrying out the process set forth in claims 1 to 4, comprising a rotary tube, the front portion of which is designed as a gasification chamber, the middle portion as a combustion chamber and the rearward portion as a secondary-combustion chamber, the middle, or combustion, chamber, being of larger diameter than the adjacent portions.

95 6). Apparatus for carrying out the process set forth in claims 1 to 4, in which a hot-gas chamber is disposed at the rear of the rotary-tube furnace, and is fitted with a known combustion grate, such as a stepped grate, for burning the coke dust.

100 7). Apparatus as set forth in claims 5 and 6, comprising a scraper device, by means of which the coke adhering in the gasification zone is passed into the

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widened zone, in order to be consumed therein.

8). The process for burning substances of low combustibility, such as asphaltum, tar, acid-resin, pitch, masut or the like, substantially as described.

9). The apparatus for carrying out the process set forth in claims 1 to 4 and 8,

constructed, arranged and adapted to operate substantially as described with reference to the accompanying drawing. 10

Dated this 2nd day of July, 1931.

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[This Drawing is a reproduction of the Original on a reduced scale.]

Fig. 1

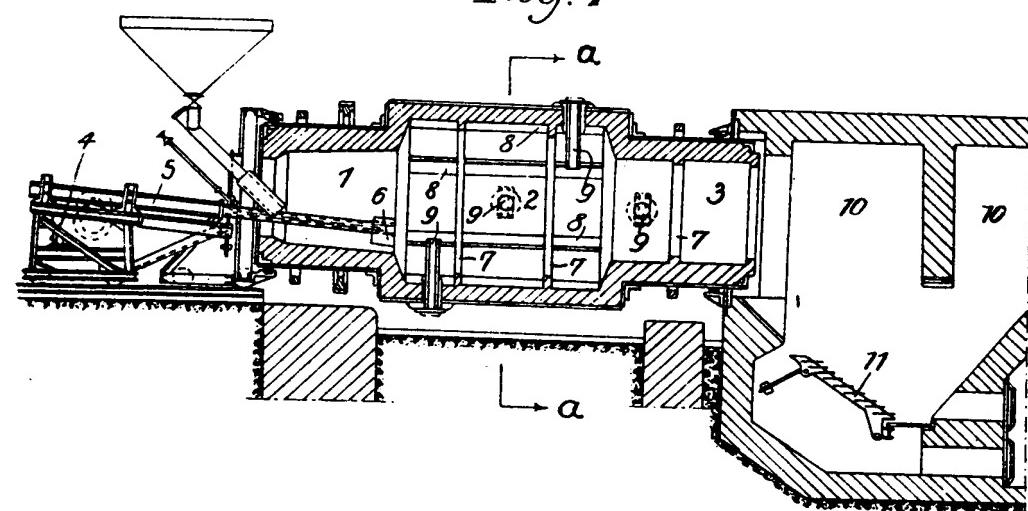


Fig. 2.

